

Mr. F. T. Trouton read a paper advocating the introduction of a coefficient of abrasion as an absolute measure of hardness.

Mr. F. H. Varley exhibited and explained the action of a new direct-reading photometer—an ingenious and compact instrument, in which intermittent illumination is employed for equalizing the intensity of illumination from two sources of light.

BIOLOGY AT THE BRITISH ASSOCIATION.

ALTHOUGH the number of papers in Section D was not quite so large as usual, it was found sufficient to occupy the time fully. As on previous occasions, the most attractive part of the proceedings was a discussion on a subject of general interest arranged beforehand, and opened by set papers.

After the President's address on Thursday, Prof. Newton gave an interesting account of the ornithology of the Sandwich Islands, discussing its peculiarities and probable affinities. He showed that the fauna is now undergoing modification, and is in danger of extermination on account of the changes which are rapidly being made in the vegetation of the islands; and he urged strongly the necessity of making a thorough examination of the fauna and flora of this important region while it is still possible. This paper led to the appointment of a committee, with a grant, for the purpose of seeing that the necessary exploration was carried out at once.

The usual reports on the zoology and botany of the West India Islands, on the migration of birds, on the disappearance of native plants, on a deep-sea tow-net, on the Botanical Station at Peradeniya, Ceylon, on the Biological Laboratory at Plymouth, and on the Zoological Station at Naples, were read, and the committees were reappointed.

The greater part of Friday's meeting was occupied by an important and interesting discussion on the teaching of botany, and especially the teaching in schools or to the young. The subject was opened with papers by Prof. Marshall Ward, Prof. F. W. Oliver, and Prof. F. O. Bower. Prof. Marshall Ward discussed the teaching of botany under the three heads: (1) elementary or school teaching; (2) more advanced or academic teaching; and (3) applied or special botany, such as forestry. He urged strongly the advantages of an early training in botany, and showed the suitability of the subject for school teaching, not however from books, but practically, and especially by means of field-work. In the teaching of applied botany he considered that principles and generalizations were of more importance than masses of facts, even in the training of the so-called practical man.

Prof. Oliver treated chiefly of the teaching of elementary botany to medical students at our colleges; and Prof. Bower dealt also with the arrangement of the usual junior University course, which he considered should be wide in its range and suggestive, rather than more restricted and exhaustive.

A number of other teachers of botany joined in the discussion; and Dr. Forsyth, of the Leeds Higher Grade School, showed that many of the suggestions which had been made were being carried out at his school, where the pupils were taken periodically to the fields to collect the specimens for their object lessons.

Prof. Marsh then gave an interesting account of the Cretaceous mammals of North America, of which he had now in his possession over 1000 specimens, all obtained during the last year or so. These remains all appear to belong to the lower forms of Mammalia, such as Monotremes and Marsupials, and are all of small size, although they are found in the same beds with the gigantic Dinosaurs, such as *Triceratops*.

Prof. Denny gave an account of an abnormality which he had found in three successive seasons in some flowers of *Tropaeolum*, and which consisted in the inversion and in some cases duplication of the spur. Prof. Denny suggested that these abnormal flowers seemed to indicate that the spur was really the representative of the two missing stamens.

Canon Tristram contributed some notes on the natural history of Hierro and Graciosa, two outlying islands of the Canary Group. A paper by Mr. E. H. Hankin dealt with the modifying action of ferments, such as trypsin and pepsin, upon diseases caused by bacteria, e.g. anthrax. It is suggested that the injection of the ferment causes a "defensive proteid" to be formed and thrown into the circulation for the purpose of killing the bacteria.

On Monday, Prof. Miall and Mr. Hammond gave an account of the development of the head of the adult fly in the life-history of the dipterous insect *Chironomus*, commonly found in impure water. Prof. Marshall and Mr. Bles called attention to variability in development amongst allied animals, and even amongst individuals of the same species. Dr. P. H. Carpenter contributed notes on the anatomy and morphology of the Cystidea.

Mr. S. F. Harmer discussed the regeneration of lost parts in the Polyzoa, including the formation of new polypites in *Pedicellina* on the tips of the old stalks where no endodermal tissues are present. Dr. S. J. Hickson gave two papers on the Hydrocorallina—the one dealing with the meaning of the ampullæ in *Millepora murrayi*, which were found to contain modified dactylozooids bearing only very large sperm sacs; and the other being on the gonangia of *Distichopora* and *Allopora*. An important conclusion drawn from these investigations was that, as regards the position and character of the gonads, *Millepora* is not related to any of the Stylasteridae.

Amongst a number of botanical papers read on Tuesday were: one by Mr. R. Warrington, showing that certain bacteria have the power, usually supposed to be peculiar to chlorophyll-bearing organisms, of forming organic compounds from inorganic materials; one by Prof. Bower, on the phylogenetic relationships between the different groups of Ferns; one by Prof. P. Geddes, on the origin of protandry and protogyny; and one by Dr. J. M. Macfarlane, on hybrids, in which it was shown from a number of genera of plants that certain hybrids which had been produced were intermediate, not only in appearance and general structure, but even in the most minute histological details, between the two parent species.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

IN the quality and scientific value of the papers, this Section was considerably above the average of last year. There were only about a score of papers altogether, but the Organizing Committee had determined rather to be short of papers than to accept any of trivial importance. As it was, the time of the Section during the four days on which it met was well filled up. The sittings were well attended, and sometimes almost crowded; which is saying much, considering the size of the hall in which the Section met. The Section adopted a plan which answered admirably. It adjourned each day from 1 to 2 p.m., and invariably a good audience assembled for the afternoon meeting.

The hall was well filled at the President's address, which was an excellent résumé of the physical geography of the Mediterranean and the regions around its shores. On two other occasions the lower part of the hall was quite filled by audiences evidently greatly interested. First, on the Monday, when there was a joint meeting of Sections E and F to discuss the important subject of the Lands of the Globe still available for European Settlement. Mr. E. G. Ravenstein opened the conference with a paper giving what may be called the geography of the subject. He excluded from consideration the Polar areas, desert areas, and tropical areas unsuited to a European population. He showed that, dealing with the subject from a purely theoretical point of view, the population of the world, at the present rate of increase, would, in about three or four generations, amount to something like 5000 millions. This, of course, sounds very alarming, but as in the case of the prediction of the exhaustion of our coal supply, it was shown during the discussion that we may keep our minds at ease. Prof. Marshall, Sir Rawson Rawson, Dr. Cunningham, Mr. Bourne, and others who took part in the subsequent discussion, mainly from the economical point of view, suggested various considerations in modification of those derived from the purely theoretical standpoint. The earth has still vast undeveloped resources; a more equable distribution of these among mankind is possible, and even desirable; the theoretical rate of increase will certainly be modified in various ways; the so-called deserts may, actual experiment has shown, be made, by means of irrigation from underground supplies, both fertile and habitable. The great truth which came clearly out of the discussion—a truth which ought to be widely realized now that tropical Africa is being opened up—is that European colonization, in the proper sense of the term, is impossible, so far as present experience goes, between the tropics. There are, no doubt, modifying circumstances in some cases, but these are rare. As usual in such discussions, there was a certain amount of irrelevant talk

but, on the whole, the conference quite fulfilled the expectations and the object of those who arranged it.

The hall was even more crowded, with an audience even more interested, on Tuesday morning, when Miss Menie Muriel Dowie read her paper on a journey in the Eastern Carpathians. It is the fashion in certain quarters to regard Europe as beyond the pale of geography; but to all but a very few of those who listened to Miss Dowie's delightful paper, what she had to tell about the Carpathians and their people was as new as Mr. Stanley's account of his great African forest.

Africa, of course, occupied a prominent place in the proceedings of the Section, one whole day being devoted to it. Dr. Kerr Cross, who has been stationed for many years in the Lake Nyassa region, and is well qualified for scientific observation, read a paper on the interesting plateau country lying between Lakes Nyassa, Hikwa or Leopold, and Tanganyika. The paper gave a most instructive picture of the extensive and varied area with which Dr. Cross is familiar. The information he gave about the little-known Lake Hikwa, east of the south end of Tanganyika, was specially valuable, as it had only been seen at a distance before by Mr. Joseph Thomson and a German explorer. It is brackish, of a long curved shape, and lies in a deep depression of the plateau, its basin being a parched-up wilderness. Though there has been abundant rain on the plateau around, for three years not a drop has fallen in the lake valley. Mr. E. A. Maund described in some detail Matabeleland, where he himself has resided for some years. Dr. R. A. Freeman's account of his journeys in Ashanti and neighbouring regions was of special novelty and value. The paper described a journey through a tract of country in and to the north of Upper Guinea, comprising the territories of Fanti, Assin, Adansi, Ashanti, Jaman, and Gruiinsi. The tract extends from 5° N. to 10° N., and from 0° to 4° W. The first four countries are inhabited by various branches of the great Otshwi family, and the remainder by certain pagan aboriginal tribes, and by numbers of Wongara or Mandingo immigrants. Journeying from Cape Coast, through Ashanti to Bontuku, the capital of Jaman, the author crossed three zones of country: (1) open country covered with low bush about 30 miles broad; (2) dense forest about 180 miles broad; (3) open park-like country which, alternating with grassy plains, seems to occupy the greater part of Central and Eastern Africa. On arrival at Kumassi, the capital of Ashanti, the author was received by the king and principal chiefs with great ceremony, the court of Kumassi retaining much of its former splendour. The town of Kumassi is much dilapidated, but presents many relics of great interest. Jaman is a kingdom situated to the north-west of Ashanti, about 9300 square miles in extent; its capital, Bontuku, is a large town closely resembling in appearance the towns of the Tawarek and Upper Niger. It is inhabited almost exclusively by Mahommedans, and forms an important slave depot, as do also the Gruiinsi towns of Wa and Bori. The commercial resources of the tract of country here described are considerable; over the whole of it gold is fairly plentiful, and the forest abounds in rubber plants both in the form of trees and vines. Hard woods are very plentiful, and are of great value in Europe, notably the Odum and Pappao, both of which trees reach a height of nearly 200 feet. The Kola nut also, which grows abundantly in the forest, has a great and increasing commercial value. The country is intersected by several considerable rivers which might be easily rendered navigable, and thus form great highways of trade. There are, moreover, no special obstacles to the construction of railways, and the district may thus be expected to form one of the great commercial centres of the future.

Mr. J. S. Keltie's paper on the Commercial Geography of Africa dealt with the varied physical conditions of the continent, and endeavoured to indicate the bearings of these on its industrial development and colonization. It was shown that the vast tropical region, in which Nature is most exuberant, is of insignificant commercial value compared with the countries along the Mediterranean and the region south of the Zambesi. Central Africa will only become of commercial value when, as in North and South Africa, man is able actively to interfere; the spontaneous animal and vegetable products of tropical countries can never be of great commercial importance.

Mr. A. Silva White followed with a paper showing in detail the partition of Africa among the Powers of Europe.

Two other papers of special African interest were read by Mr. Cope Whitehouse and Dr. Schlichter. The former sought

to prove that in the oldest Ptolemaic maps a depression (Lacus Meridis) is shown, exactly corresponding to the Wadi Rayan and Wadi Mullah. Dr. Schlichter, in an elaborate paper, discussed the whole subject of Ptolemy's knowledge of North-East Africa, and sought to show that many of his positions exactly corresponded with those of modern maps, obtained by quite recent explorations.

There were three papers connected with Asia. Mr. Theodore Bent's paper on his recent explorations in North-Eastern Cilicia was mainly of an archaeological character. Sir Frederic Goldsmid read a paper on a railway through Southern Persia, as a link of communication in the great railway route that will one day connect England with India. Surveys and reports by recent travellers have rendered it easy to supply this link, which may be appropriately called the Baghdad-Bandar-Abbas section, or, more minutely, the Baghdad-Shiraz and Shiraz-Bandar-Abbas sections. As to the route from Bandar-Abbas to Karachi on the east, and from Tripoli to Baghdad on the west, any doubts or difficulties that present themselves are already ripe for discussion, and their solution cannot be treated as dependent upon further travel and research. It is proposed to carry the line from Baghdad through Persian Arabistan, either by way of Dizful and Shustar, continuing along the recognized track from the latter place to Bebehan; or by an alternative route down the left bank of the Tigris, and *via* Haweizah to Ahwaz, whence Major Wells, R.E., has furnished full details of route from his own experiences. The same officer has made, moreover, very valuable suggestions on the mode of reaching Shiraz from Bebehan.

Mr. H. F. B. Lynch dealt with an allied subject in his paper on new trade routes into Persia. In the course of the paper Mr. Lynch, from his own personal knowledge, gave much information as to the physical geography of Persia, and especially the region watered by the Karun River.

South America was dealt with in two papers. Mr. J. W. Wells described the physical geography of Brazil in its bearing on the industrial development of the country, and M. A. Thouar sent an abstract narrative of his journeys during the past few years in the Argentine, Peru, and Bolivia.

Mr. Coutts Trotter gave a most useful summary of exploration in British New Guinea in recent years, dealing mainly with Sir W. Macgregor's journey to the summit of the Owen Stanley Range, already described in NATURE.

Dr. H. R. Mill gave a *résumé* of his investigations on the vertical relief of the globe, details of which have been published in the *Scottish Geographical Magazine*. He also gave an interesting account of his observations on the methods of teaching geography in Russia and of Russian geographical text-books.

Mr. Henry T. Crook's paper on the present state of the Ordnance Survey, and the paramount necessity for a thorough revision, led to the Sectional Committee's requesting the Council of the Association to move the Government to take steps for the rapid completion of the Survey, and for rendering the Ordnance maps much more accessible for purchase by the general public than they are at present.

ANTHROPOLOGY AT THE BRITISH ASSOCIATION.

ON Thursday, September 4, after the President's address, a paper by the Rev. F. O. Morris, on the doctrine of hereditism was read, and gave rise to a lively discussion, or rather a chorus of condemnation of the views advanced by the author.

In a paper by Mr. Horatio Hale, which forms the introduction to the Report of the North-Western Tribes of Canada Committee, attention was called to some of the chief peculiarities of British Columbian ethnography, the great number of linguistic stocks which are found in this comparatively small territory and the singular manner in which they are distributed, especially the surprising variety of stocks clustered along the coast as contrasted with the wide sweep of the languages of the interior. All the languages of British Columbia have a peculiar phonology; their pronunciation is singularly harsh and indistinct; and it would appear that this is due mainly to climatic influences, for, south of the Columbia River, the harsh utterance suddenly ceases and gives place to softer sounds.

A paper by Mr. J. W. Fawcett was read on the religion of the Australian aborigines. The author stated that the Australians believe in a Creator, in a future life, and in good and